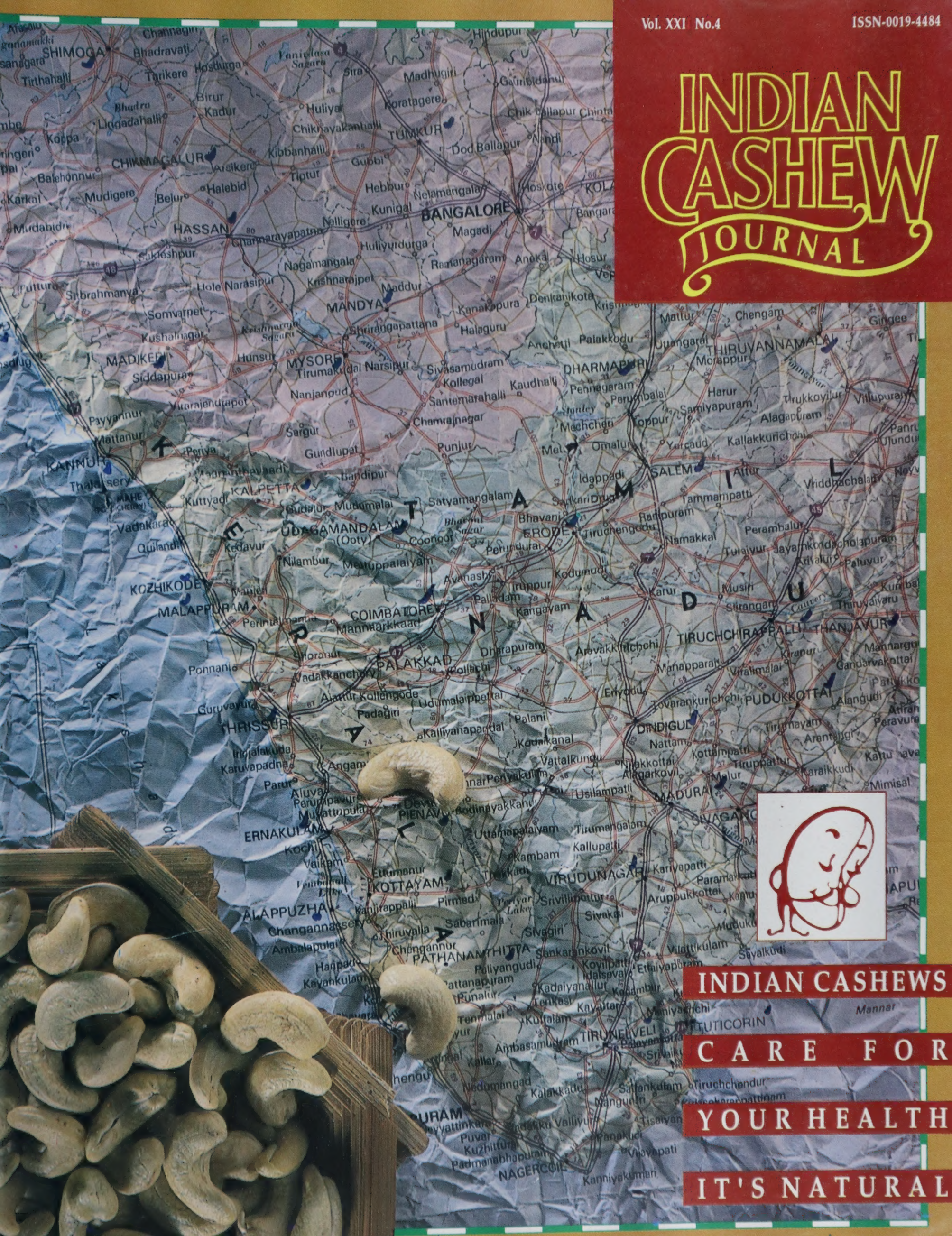
Vol. XXI No.4 ISSN-0019-4484

INDIAN CASHEW JOURNAL



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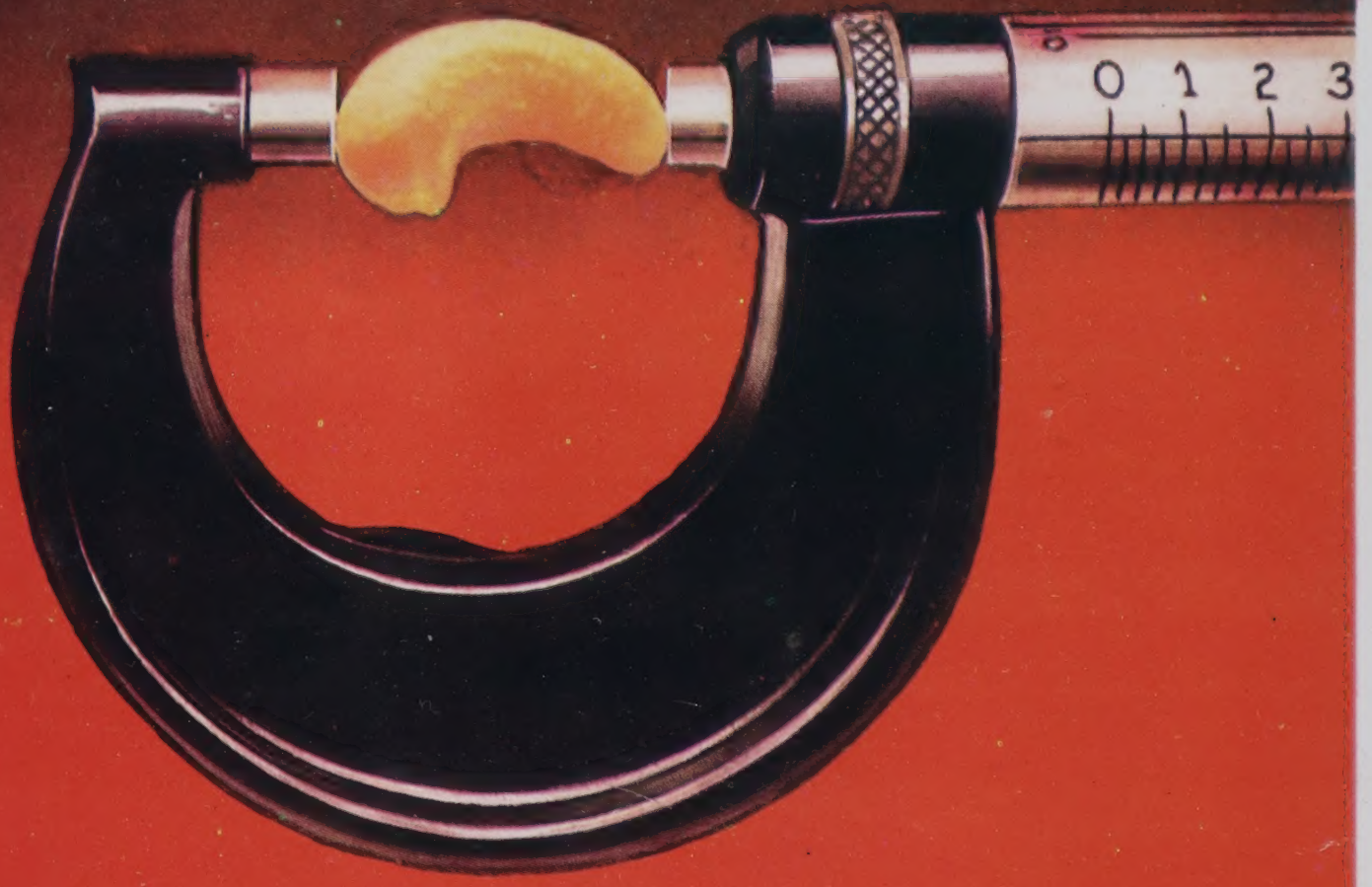

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INDIAN CASHEW JOURNAL

A quarterly publication of the Cashew Export Promotion Council of India.

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Designed at
Cornet Communications
Cochin-682 036.

Printed at
Amara Kerala Industries,
Cochin, 682 018

Contributions

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Publisher

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CASHEWNUT AS A CONSTITUENT OF HEALTHY DIET

Dr. C. R. Soman

Introduction

The role of balanced diet in contributing to a long and healthy life is undisputed. Diet related diseases are quite common even among the people of the affluent West. Unlike in developing countries, where many diseases are caused by deficiency in the quantity and quality of diet, the diet related diseases among affluent populations result from excessive consumption of undesirable foods. Over–consumption of foods of animal origin like meat and eggs are implicated in the causation of atherosclerotic heart diseases. Annual food consumption has also been suggested as a possible aetiological factor in some cancers. Fats of animal origin are saturated in nature; it is well known that excess consumption of saturated fats is bad for health. Evidence from epidemiologic and experimental studies clearly indicate that excess saturated fats elevate serum cholesterol. Raised serum cholesterol is the single most important biochemical risk factor for heart attacks.

On the basis of the awareness that excess animal food consumption is harmful, recent dietary guidelines all over the world recommend a reduction of intake of meat and meat products and a liberal increase in consumption of fruits and nuts. Like meat and eggs, nuts are abundant in proteins, the body building material essential for growth and maintenance of tissues. Nuts are also a concentrated source of energy, since they contain liberal amounts of fat *(Table I)*.

TABLE I: NUTRIENT VALUES OF SELECTED ANIMAL FOODS AND NUTS

	Composition/100 g						
	Food	Edible portion	Water %	Protein %	Fat %	Carbohydrate %	Energy K.cals
Animal Food	Chicken egg	100	75.1	12.5	10.8	Trace	147
	Beef (Sirloin)	92	59.4	16.6	22.8	0	272
	Chicken, meat and skin	64	64.4	17.6	17.7	0	230
Fish	Herring(raw)	55	63.9	16.8	18.5	0	234
Nuts	Almond	100	4.2	21.1	55.8	6.9	612
	Cashewnut	100	2.4	20.5	50.9	18.8	611
	Peanut	100	1.9	24.5	53	7.1	602

Dr. C.R. Soman, B.Sc., M.D., M.Sc. Former Professor & Head, Dept. of Nutrition, Govt. Medical College, Trivandrum and Consultant Nutritionist, 318, Prasant Nagar, Medical College P.O. Trivandrum 695 011, India.

It is clear from the table that nuts in general provide more than twice the energy furnished by meat and fish. They are also richer in proteins. The energy provided by nuts is more than twice that provided by all the animal foods (above 600 Kcals/100 g vs 147- 272 Kcals). It is also evident that nuts in general are abundant sources of fat which account for the high energy density. Among the nuts, cashewnut is the richest source of carbohydrate. The data clearly suggests that cashewnut is an excellent food, providing a reasonably balanced mixture of proteins, fat and carbohydrate.

Cashewnut as a source of protein.

We have already seen that cashewnut provides more protein than any meat or fish. The question one has to consider is whether the quality of cashewnut protein compares favourably with that of animal protein. It is generally considered that on an individual basis, animal proteins rank higher than any vegetable protein. However, in actual dietary situations, this is not of much significance since man does not depend on a single source of protein. The proteins derived from different sources ensure that even strict vegetarians can meet their protein requirement without any risk to their health.

The quality of a protein is determined by the essential amino acid content of the protein. We shall now examine the essential amino acid composition of cashewnut protein and related to other protein sources *(Table II)*.

TABLE II : ESSENTIAL AMINO ACID CONTENT OF SELECTED FOODS

	Beef	Egg-chicken	Almond	Cashew nut	Peanut	Rice(raw) milled
Approx. Total Ng/100g	3.6	2.13	3.33	3.39	4.05	1.09
Arginine	410	40	660	650	690	480
Histidine	200	150	140	130	140	130
Lysine	540	440	460	290	230	230
Tryptophan	70	90	50	110	60	80
Phenylalanine	260	360	300	270	310	280
Tyrosine	220	250	180	-	240	290
Methionine	160	210	100	90	60	150
Threonine	280	320	170	200	170	230
Leucine	510	520	480	510	400	500
Isoleucine	320	410	280	320	240	300
Valine	330	450	310	360	280	380

* Amino acid concentration expressed as mg/gm of N.

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The table reveals that the essential amino acid content of the cashewnut protein compares favorably with that of other nuts. In fact cashewnut protein is richer in five essential amino acids when compared with rice protein, rated as one of the superior vegetable proteins. However, when compared with animal proteins, cashewnut protein contains relatively lower amounts of lysine, threonine and methionine.

The limiting amino acid thus appears to be methionine, the sulphur containing amino acid. This in no way renders cashewnut undesirable,since the major constituent of diet will provide adequate amounts of methionine. Including cashew in the daily diet (at least one serving a day) would ensure an excellent supply of protein, simultaneously providing liberal amounts of energy. The replacement of animal foods brought about by substitution with cashew will enable a reduction in the risk of atherosclerotic heart disease.

Cashewnut as a source of fat

We have already mentioned that 100g cashewnut provides over 50g of fat. The crucial consideration would be the nature of the fatty acids provided by cashewnuts. Unlike animal foods (eg. meat and egg), cashew provides a predominantly unsaturated fat. The fatty acid profile of cashewnut is provided in *Table III*.

TABLE III

FATTY ACIDS / 100 G OF CASHEWNUTS

Saturated fatty acids	10.1
Monounsaturated fatty acids	29.4
Polyunsaturated acid	9.1

It may be seen that the ratio of saturated: monounsaturated: polyunsaturated fatty acids is 1:2:1, ideal for human consumption. The latest dietary recommendations from the US suggest that only 1/3 of the total calories shall be from saturated fats and another third atleast from polyunsaturated. The relative abundance of monounsaturated fatty acids in cashewnut is an advantage since monounsaturates are now believed to be as efficient as polyunsaturates in lowering serum cholesterol with less risk from excess consumption of polyunsaturates. Linoleic acid contributes nearly all of the polyunsaturated fatty acids of cashewnut. Linoleic acid (C 18 $\triangle$ 2) is the essential polyunsaturated acid.

The facts mentioned above make it abundantly clear that the fatty acid profile of fatty acid conducive to the promotion of good health and that the relative abundance of fat in cashewnut in no way poses a nutritional risk.

Cashewnut as a source of minerals and vitamins

An ideal dietary constituent shall provide in addition to the proximate principles, a good blend of micro nutrients like vitamins and minerals. Here again, cashew satisfies the criteria. Cashewnut is a good source of sodium, potassium, calcium, magnesium, phosphorus, iron, copper, zinc , manganese, chlorine and

TABLE IV

INORGANIC COMPOSITION/100 G OF SELECTED FOODS

Elements	Cashewnut	Almond	Peanut
Sodium	290	14	400
Potassium	730	780	810
Calcium	35	240	37
Magnesium	250	270	180
Phosphorus	510	550	410
Iron	6.2	3	1.3
Copper	2.04	1	0.54
Zinc	5.7	3.2	2.9
Chloride	490	18	660
Manganese	1.8	1.7	1.9
Selenium(micrograms)	34	4	4

even selenium. It is significant to note that cashewnut provides much more of the trace elements like iron, copper and zinc than other members of the nut family.

It is clear from *Table IV* that cashewnuts provide more of the essential trace elements like iron, copper and zinc, than the other popular members of the nut family.

TABLE V: VITAMIN CONTENT OF SELECTED NUTS

Vitamins	Almond	Peanut	Cashewnut
Retinol	0	0	6
Carotene	0	0	6
Vit. D	0	0	0
Vit. E	23.98	10.09	1.3
Thilamine	0.21	1.4	0.41
Riboflavine	0.75	0.1	0.16
Niacin	3.1	13.8	1.3
Trypt./60	3.4	5.5	5.2
Vit. B6	0.15	0.59	0.43
Vit. B 12	0	0	0
Folate	48	110	68
Pantothenate	0.44	2.66	1.08
Biotin	64	72	13
Vit. C	0	0	0

Vitamins

Table V provides information on the vitamin content of certain selected nuts.

One can conclude that cashewnut provides in small quantities most members of the B Complex group of vitamins. Among the fat soluble vitamins, only vitamin E is present and that too in minimal amounts. The amount of carotenes is also quite low. One cannot therefore consider cashewnuts as a major provider of vitamins to the diet. However, the contribution though small will help supplement the vitamin intake.

Summary

The importance of a varied and nutritionally sound diet is being increasingly recognized. An ideal diet should include liberal amounts of vegetable foods. Nuts have an important role in the daily diet of individuals irrespective of the culture and race. Two-to-three servings of nuts and fruits daily are recommended by most nutritional committees to ensure that people consume a healthy diet.

As we already discussed, cashewnuts are excellent dietary supplements in the human diet. Protein is present in abundance and, that too, of a good quality. Cashewnut provides a rich blend of minerals and many water-soluble vitamins. A regular serving of cashewnut will supplement the micro- nutrient intake of individuals. The fat content in cashewnut makes it an energy-rich food and the fatty acid profile is ideal for human consumption.

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The high protein content and energy density of cashewnut makes it an ideal supplement in the diet of children, pregnant women, lactating mothers and convalescing people. Consumption of cashewnut primarily as a protein and energy source, as an alternative to meat and meat products, will reduce the risk of ischaemic heart disease.

A significant feature in favour of cashew is its delightful taste and that it can be incorporated into a wide range of cuisines. Plain cashew kernels are adaptable to any form of cooking or cuisine. It is extensively used in Indian and Chinese food and moderately in other cuisines. It blends well with ice-cream, cookies, biscuits and confectionery.

Cashewnut is easily consumed in plain form and delectable while offered in roasted form whether in oil or dry roasted. It is also available in versions like honey roasted and other forms like chocolate, rum coated etc. The incorporation of cashewnut into the regular diets would enhance the nutritive qualities of the diet while improving palatability.

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EXECUTIVE DIRECTOR OF ITC VISITS CEPC

The members of the Committee of Administration of the Cashew Export Promotion Council of India (CEPC) met Mr. Raju Makil, Executive Director, International Trade Centre (UNCTAD/GATT), Geneva, on 31st December 1993. The meeting took place at the conference hall of the Council at Cochin.

Dr. K.G. Nayar, Secretary of the Council, in his welcome speech, mentioned that ITC has assisted many Indian products for the development of exports. He hoped that the visit of Mr. Raju Makil would pave the way for ITC assistance to the Indian Cashew Industry also. He also short-listed the problems of the cashew industry. The most important problem of the cashew industry is the shortage of raw cashewnuts. Mr. Makil suggested that the Council should take initiative to organise a national symposium to highlight the importance of the export trade in employment generation and poverty alleviation. The participation from the authorities of the State Governments, Central Government, media etc. should also be assured. This would make the decision-makers connected with export development realise that export is the concern of not only a few entrepreneurs, but also of vital importance to people from all walks of life, like factory workers and farmers.

In response to a query by Mr. Makil as to the problems facing the industry, Mr. T.K. Shahal Hassan Musaliar, Chairman, CEPC, explained that the retail markets, especially for the consumer packs of cashew kernels in the developed countries were dominated by large corporations. Exporters from the developing countries like India often find it difficult to compete

Mr. T.K.S.H. Musaliar, Chairman, CEPC, discussing with Mr. Raju Makil, Executive Director, ITC at the meeting organised by the Council

with these giants. He felt that Government support or assistance from organisations like ITC is absolutely necessary for the promotion of value added products of cashew from India.

Mr. Makil assured the Council that like the Coir Board, Spices Board and MPEDA, it could also avail of the assistance of ITC in its export development programmes.

Mr. Makil also suggested that health and nutritive value of cashew could be highlighted as a unique selling point to promote

Mr. Makil with members of the Committee of Administration of the Council

Mr. Makil in discussion with members of the Committee of Administration of the Council

consumption of cashew in international markets. He informed that any proposal/ scheme in the proper format, for assistance from ITC should be routed through the concerned Department of the Govt. of India. If the schemes have some cost sharing programmes with other producing or importing countries it will be easier to get technical and financial assistance from ITC for such projects, he added.

DEMONSTRATION OF PACKAGING SYSTEM FOR CASHEW

Indian Cashew Exporters, under the aegis of the Cashew Export Promotion Council of India (CEPC), met Mr. James P. Giles, Vice President, Quality and Environmental Affairs, Planters Life Savers Company, USA, one of the major importers of cashew kernels from India. He is also a member of the Pesticides, Packaging and Specifications Sub-Committees of the Association of Food Industries, USA.

The meeting was held at Hotel Sudarsan, Quilon on 16th December, 1993. Besides leading cashew exporters, experts from the Export Inspection Agency, Cochin, and Indian Institute of Packaging, Bombay, attended the function.

More and more importing countries, especially USA and Germany, are insisting on new generation packaging which are eco-friendly, chemically neutral and easily recyclable and disposable. This problem was discussed in detail at the meeting.

Considering the urgency of the situation, the Cashew Export Promotion Council has decided to take a two pronged approach to the

Mr. T.K. S.H. Musaliar addressing the Dissemination Seminar on Packaging Development. Also seen are Ms. M.C. Dordi, Deputy Director, Indian Institute of Packaging, Mr. James P. Giles, Planter's Life Savers Co. U.S.A and Mr. Bharathan Pillai, Vice - Chairman of the Council

A rapt audience at the Dissemination Seminar on Packaging Development

packaging problems of the cashew industry viz., (1) Use of lead free solders in tin containers as a short term measure. (2) To evolve a new system of flexible packaging which will replace tin containers altogether.

The Council has entrusted the Indian Institute of Packaging, Bombay, the task of evolving a suitable packaging system for the emerging market requirements of the cashew industry.

During the discussion Ms. M.C. Dordi, Deputy Director Indian Institute of Packaging, Bombay, explained the progress made in developing an alternative packaging system for cashew kernels.

As regards the problem of pesticides residue in cashew kernels, the representatives of the Export Inspection Agency informed the meeting that they have not detected any pesticide residue on samples tested during 1993. The different measures taken by the Agency to eradicate pesticide residue in cashew - like the training centres to educate factory workers and supervisors to avoid the use of any pesticide in cashew factories were put across to Mr. Giles.

Mr. Giles in turn expressed satisfaction on the different measures taken by the cashew industry in India, especially by the Cashew Export Promotion Council of India, to tackle the problems like pesticide residue and packaging and extended his whole hearted support to these ventures.

EIGHTH PLAN PROGRAMMES FOR CASHEW DEVELOPMENT

Projects and programmes with an outlay of Rs. 48 crores for improving the cashew production during the 8th Five year Plan have been launched.

These programmes are being implemented in the states of Kerala, Karnataka, Goa, Maharashtra, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal, Madhya Pradesh , Manipur and the Union Territory of Andaman and Nicobar Islands. Under the schemes, steps would be taken to achieve an increase in production to six lakh tonnes of raw cashewnuts by the turn of the century, from the present production of 3.5 lakh tonnes.

The country earned foreign exchange to the tune of about Rs. 750 crores by exporting cashew kernels and allied products during 1992-93. Considering the significance of cashew in the Indian commercial scenario, the Directorate of Cashew Development under the Ministry of Agriculture has drawn up massive projects for increasing the indigenous production of cashewnuts. The rate of growth aimed at, is 8 percent per annum. According to these proposals, by 1996-97, which will mark the end of the 8th Plan, the production of indigenous raw cashewnut is expected to reach 4.40 lakh tonnes.

Cashew Plantations

The projects approved by the Planning Commission for production and development of raw cashewnuts in the country includes new planting in 43,000 hectares, replanting or rejuvenating of senile and uneconomic cashew gardens in 10,000 hectares, adoption of intensive horticultural management practices in 25,000 hectares and adoption of crop protection measures in 1,46,000 hectares. The

-Continued on page 28-

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IN VITRO EMBRYOGENESIS IN CASHEW (Anacardium occidentale L.)

Mahabaleshwar Hegde, M. Kulasekaran, S. Jayasankar and K.G. Shanmugavelu*

ABSTRACT

Immature cotyledon sections of cashew underwent a direct embryogenesis in Lin and Staba medium supplemented with activated charcoal (0.005 per cent), ascorbic acid (150 mg/l), Ca-Pantothenate (200 mg/l), sucrose (2 per cent), agar (7 mg/l), IAA (2 mg/l), and BAP (2 mg/l). Globular embryoid structures emerged out of the swollen cotyledon sections profusely. In the presence of low level of auxin or without any growth regulator the embryoids further developed into torpedo, and then to cotyledon structures. Leafy shoots and roots were differentiated on MS medium with 1 g/l activated charcoal. Pre-emergence of hypocotyl/roots indicated the strong development of root initiation and poor shoot meristem growth.

Introduction

The existing plantations in the country are of mostly seedling origin. Owing to this reason, the yields are highly erratic since cashew is a highly cross pollinated crop. It is estimated that through high yielding clones and with better management practices it is possible to increase the yield to 2000 kg per ha. The production of clonal material in large scale is limited, even though vegetative propagation techniques are available like air-layering, veneer grafting, budding and the recent epicotyl grafting technique. Large scale multiplication is however possible if tissue culture techniques are available. Very limited attempts in cashew have been made in this regard probably because of the interference of phenols and tannins in the establishment of cultures. Among the available literature, Phillip (1984) initiated multiple plantlets through mature cotyledon part and Jha (1986) obtained embryogenesis through immature embryo callus.

The present investigation deals with embryogenesis without intervening callus production from immature and slightly matured cotyledon sections of cashew.

Material and Methods

In cashewnut (Anacardium occidentale L.) after pollination, the ovary enlarges and within one week the young nut becomes visible to the eye. During first two weeks, the pericarp grows more rapidly than the embryo and then, the embryo development starts. In 5-7 weeks after fruit set, the shell cavity is filled completely with the kernel. Later the nut shell shrinks and becomes hard (Ohler, 1979). At this stage it is very difficult to cut open the shell with an ordinary blade or knife.

In the present investigation two kinds of nuts were selected i.e., immature (3-4 weeks old) and slightly mature (5-6 weeks old i.e., before the nutshell becomes hard) nuts.

* *College of Horticulture, Tamil Nadu Agricultural University, Coimbatore - 641 003.*

Fresh seednuts from the healthy inflorescences were collected from the bearing cashew tree and thoroughly washed with running water, then with distilled water and sterile water 3-4 times each. The whole nuts were surface sterilised with 2 per cent sodium hypochlorite for 30 minutes inside the laminar flow chamber and again washed with sterile water 3-4 times.

Holding the nut firmly in one hand and using a sterile blade (surgical blade with a handle) in the other, an incision (2-3 mm deep) was made along the convex surface of the seednut shell. Later, the shell was easily split open. The whole kernel with embryo intact was scooped out. Embryos were separated from the cotyledons. Each cotyledon was cut into small pieces (4-5 in immature and 7-8 in slightly matured nuts) of 3-4 mm in size. Once again the cotyledon sections were thoroughly washed with sterile water 4-5 times till the white turbidity development due to cotyledon exudation ceased.

The explants were cultured on Lin and Staba (1961) medium supplemented with ascorbic acid (150 mg/l), Ca-Pantothenate (200 mg/l), activated charcoal (0.005 per cent), agar (7 mg/l) and different levels of IAA plus BAP combinations. For each treatment 25 explants were inoculated. The cultures were kept under low light intensity with 20 hours light and 4 hours dark period at a constant temperature of 24° C.

After the initiation the embryoidal structures were subcultured into fresh media for further multiplication and growth using different hormonal combinations.

Result

Numerous embryoids were produced in immature and slightly matured cotyledon sections without an intervening callus production in the presence of different levels of IAA and BAP combinations. Maximum response (52 per cent) was obtained with 2 mg/l each of IAA and BAP. Majority of the cotyledon explants produced embryoidal structures in a period of 60-75 days of culturing and continued upto 90 days (Table 1).

Even the immature cotyledon sections cultured previously on Lin and Staba medium, supplemented with NAA (0.5 mg/l) plus Kinetin for 75-90 days and then transferred to IAA (2.0 mg/l) + BAP (2 mg/l) containing medium also produced embryoidal structures within next 15 days.

Cotyledon sections become swollen 2-3 times of its original size in 2 weeks of culturing and thereafter remained static. Apparently they turned black in next 4-5 days due to exudation. If media browning was too high it required a subculture into fresh medium at this stage.

Nearly 7-8 weeks after culturing, globular, yellowish mass of structures appeared on the inner sides of the cotyledon sections. In the next 15 days these structures burst open into small embryoidal mass surrounded by whitish leaf like structures (Plate 1). These minute embryoids further multiplied and increased in size in next one month of growth period. When the whole structures along with the mother tissues (cotyledon parts) were transferred to fresh medium with similar hormones, they attained torpedo shaped structures (Plates 2A&2B). The further growth and multiplication was also observed when 3-4 embryoidal structures were separated together and cultured on to fresh medium (Plate 3).

Subculturing on to medium with reduced level of auxin alone (0.25 mg/l IAA or NAA or 2,4-D) resulted in

Plate-1: Initiation of globular embryoidal structures from immature cotyledon sections (After 7-8 weeks of culturing)

Plate-2A: Development into torpedo shaped structures (75 days old) - 4X size.

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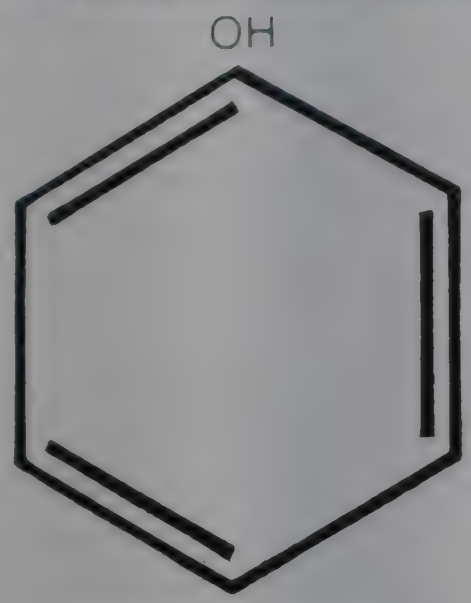

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Plate-2B: From Torpedo to white cotyledonary structures (90 days old)

Plate-3: Further multiplication on sub culturing after separation from mother tissues.

multiplication again, and torpedo like organs further thickened and increased in size to form cotyledon like structures in another one month. Some of them produced thick hypocotyl and roots in the absence of growth regulator in further 15-20 days (Plate 4). In the presence of coconut water (15 per cent v/v) cotyledonary structures produced callus and the whole structures turned black due to exudation of brown substances.

On MS medium with one per cent activated charcoal, the torpedo shaped structures developed into leafy shoots and roots in a period of next 30 days (Plate 5).

Discussion

The embryogenesis was induced directly from the immature cotyledon parts in presence of various levels of IAA and BAP, 2mg/l each being optimum for maximum response. After the initial swelling the cotyledon sections remained unchanged. If a section was removed and cut with a sharp blade, it had the same original texture and no softening of the tissues was observed. This indicates that the swelling was only due to enlargement of cells. In contrast to this Jha (1986) had obtained embryoid structures from the callus of immature embryo in presence of 4 mg/l,2, 4-D and 2 mg/l Kinetic on Schenk and Hildebrandt (1972) medium.

Transferring the cotyledon explants initially to fresh medium after 10-15 days of culturing was necessary, if media browning was more. The addition of charcoal, ascorbic acid and Ca- Pantothenate into culture medium considerably reduced the medium browning whereas, without these ingredients even with 4-5 subcultures it was difficult to overcome the media browning. Further, it was advantageous to culture the explants in larger vessels (250 ml flasks). Larger volume of media favours more dispersal and absorption of the exudation products. In fact few cotyledon cultures initiated embryoids in larger vessels even without a single subculture on to fresh medium. Such beneficial effect of using larger culture vessels can also be attributed to different concentration levels of CO_2, ethylene and other volatiles in the air space within the container.

Initiation of embryogenesis was observed under low light intensity with 20 hours light and 4 hours dark period. There are reports that embryogenesis has occurred under variety of light and dark conditions in different crops. Whether, the cashew needed above particular photoperiod for initiation of embryoids can be confirmed by varying light and dark periods.

Table - 1

Embryogenesis from immature cotyledon section of cashew

Hormone levels (mg/l)	Per cent cotyledon sections forming embryoids after			
	60 days	75 days	90 days	Total
IAA 1.0 + BAP 1.0	4.0	32.00	0.00	36.00
IAA 1.0 + BAP 2.0	0.00	12.00	12.00	24.00
IAA 1.0 + BAP 3.0	0.00	4.00	4.00	8.00
IAA 2.0 + BAP 1.0	0.00	28.00	4.00	32.00
IAA 2.0 + BAP 2.0	12.00	36.00	4.00	52.00
IAA 2.0 + BAP 3.0	4.00	16.00	4.00	24.00
IAA 3.0 + BAP 1.0	0.00	4.00	0.00	4.00
IAA 3.0 + BAP 2.0	0.00	8.00	20.00	28.00
IAA 3.0 + BAP 3.0	4.00	28.00	0.00	32.00

Plate-4: Thick roots in presence of 1 mg/1 IBA

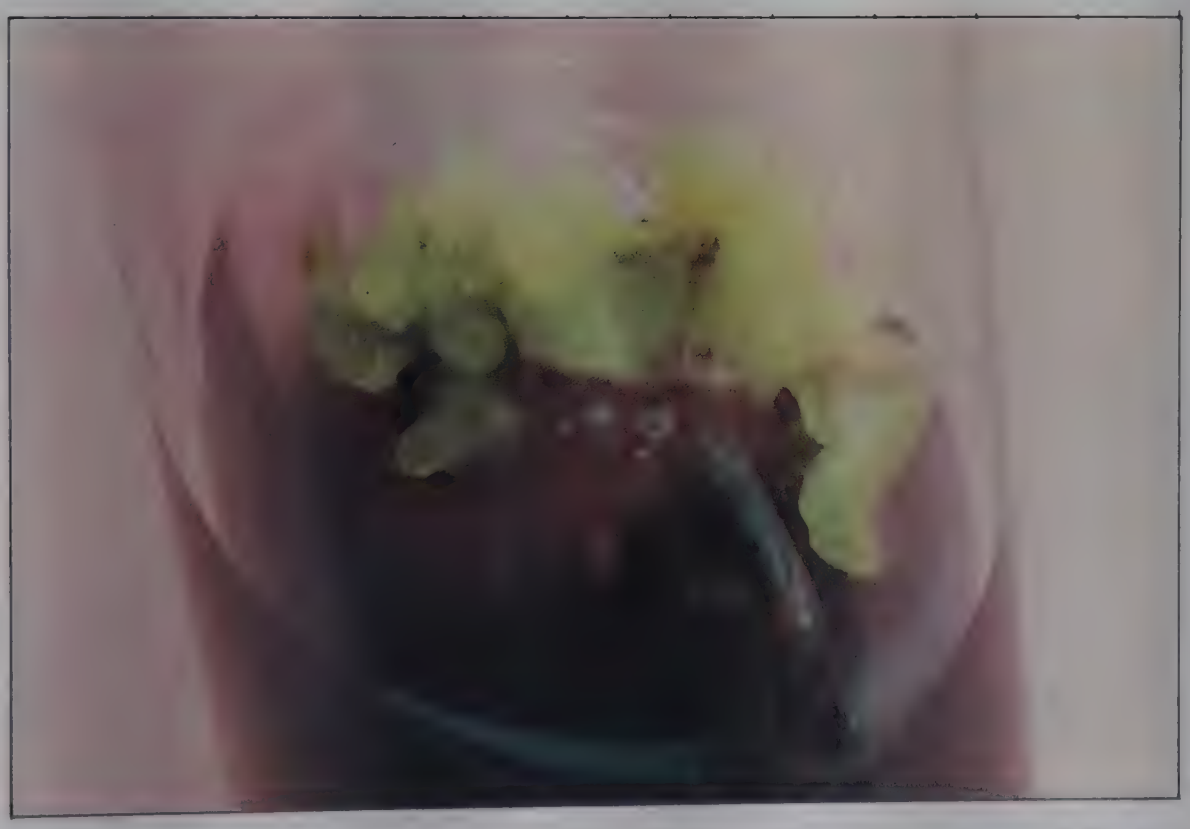

Plate-5: Bipolar differentiation of leafy shoots and roots on MS medium with 1 mg/1 activated charcoal (4X size)

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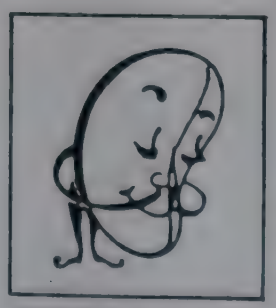

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Repeated subculturing of embryoidal structures resulting in further multiplication again and again shows that the embryogenic cultures can be maintained for long time. In the case of walnut cotyledon cultures, similar response wherein embryogenic cultures maintained for more than a year, by repetitive embryogenesis had been observed by Tulecke and McGranahan (1985). Sub-culturing at 20-25 days interval was observed to be optimum for maintenance of cashew cotyledon embryoids.

The origin of embryoidal structures appeared to be endogenous, since the embryoids were continued to be formed in large numbers from the surface of the cotyledon tissue for a period of 2-3 months. Similarly in cocoa, Pence et al. (1981) reported that somatic embryoids developed from internal tissue of cotyledon. However, in cashew, the confirmation through histological study is necessary.

Premature emergence of hypocotyls and roots indicates the strong development of the root regions and poor growth of the shoot meristems. Appropriate manipulation of media and growth regulators will perhaps overcome this problem.

Cotyledon sections cultured previously in presence of NAA (0.5 mg/l) and Kinetin (1 mg/l) for 75-90 days and later transferring to medium supplemented with 2 mg/l each of IAA and BAP also initiated embryoids in another 15 days. This indicated perhaps the specificity of the auxin and cytokinin for embryogenesis. Whether, the additional ingredients added to the medium to prevent media browning also have a role in initiation of embryogenesis needs confirmation.

Conclusion

Embryogenic cultures were maintained by repeated subculturing. Thus, large number of embryoids could be produced. Further standardisation of media, growth regulators and cultural environment for complete embryoid maturation and germination is necessary. Since the embryogenesis has initiated without an intervening callus, all the embryoids could be clonal in nature. This technique can meet the demand for large number of clonal material for increasing the productivity.

Acknowledgement

The authors are grateful to the Tamil Nadu Agriculture University, Coimbatore, for extending facilities to carry out this study. The senior author acknowledges the ICAR for offering financial assistance as senior fellowship during the study period.

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COCHIN -THE TRADE QUEEN OF THE ARABIAN SEA

The history of India's international trade is probably as old as human civilisation itself. The Vedas, the Bible and the Quran are all replete with references-direct or indirect-to Indian Spices.

But the history of any sort of trade from Cochin starts very late, with the floods of the River Periyar in 1341AD. With it Muziris (Kodungalloor) which lies at the mouth of the Periyar got clogged up with dirt and the result was the emergence of Cochin as a major port of South India. The Kingdom of Cochin was established by the nephew of Rama Varma Kulasekhara and in 1405 AD the capital of Perumpadappu was shifted to there. By the time Ma Huan in 1409 AD and Nicolo Conti in 1440 AD came to Kerala, Cochin was a teeming port, as their accounts of the place relate. Caeser Fredric also writes about Cochin in his notes, relating its importance as a centre of commerce and the position the Portuguese had there. The much photographed Chinese fishing nets at the harbour mouth stand even now in mute testimony of the pre-European association of Cochin with China.

Chinese fishing nets

Although the Chinese and the Arabs had started trade with Cochin, it achieved prominence only by the 16th century ,with the advent of the Portuguese. It was the Portuguese who evolved a scientific scheme for cultivating spices like pepper & cardamom. With their intervention commodities

could be directly shipped to European markets. They also brought cashewnuts, tobacco and papaya to the shores of Kerala.

In 1502 AD, Portuguese seafarer Vasco da Gama came to Cochin seeking spices and converts. He found spices, launched Europe's great age of exploration and prayed in the first European Church in Asia. His Roman Catholic faith, however, conflicted with existing Syrian Christian religion and Cochin's ancient Christians swore that they would never accept aggressive Portuguese suzerainity. Vasco da Gama died in Cochin on Christmas day of 1524, and was buried in his Church. Though his remains were later moved to Portugal, his grave is marked with a plaque and a brass rail. Portuguese headstones and those of their successors are embedded in the walls of St. Francis Church,reputedly named after St: Francis of Assisi, but associated with the Spanish missionary, St. Francis Xavier, who is said to have worshipped here. Continuing the saga of intolerance towards other religions , the Portuguese looted the Palluruthy Temple.

St. Francis Church

In 1555 AD, they built the Mattanchery Fort (Dutch Fort) and presented it to Kerala Varma to pacify him. Unlike the Portuguese the kings of Cochin were very tolerant of other faiths. European Jews, fleeing persecution at home, settled in Jew Town near Mattanchery Palace. Many Jewish families have now migrated but their beautiful four century old Synagogue still has the Scrolls of the law, chandeliers and a brass railed pulpit. The Mattanchery Palace over-looking the Synagogue even now holds the royal palanquins, weapons, robes and beautiful murals. The people of Cochin renamed the Mattanchery Palace as the Dutch Palace, to honour the Netherlanders when they defeated the Portuguese on 7th January , 1663. Above the gateway to Stuber Hall, the crest of Dutch East India Company has been proudly preserved.

The Portuguese were still ruling the roost when the English under Captain Keeling first landed in Kerala. But they had to wait till December, 1795 to get control over Cochin. The Dutch surrendered to the British under Major Petrie on that particular day.

Though the old Portuguese Fort had been reduced to just a bastion house, the Fort Cochin area became the centre of Britains trading interest. Even now some trading houses of the British Raj still deal with spices, coir, cashew, rubber and tea.
On 15 August, 1947, however the Indian Tricolour replaced the British Crown. Indians once again began to control their own destiny, 445 years after Vasco da Gama first established Cochin on the map of battle for European supremacy.
Now, the Queen of the Arabian Sea stands unchallenged in the matter of exports. Last year Cochin stood first as regards the quantity of cashew kernels exported from a single port in India. Out of a total export of 68968 MT Cochin accounted for 30701MT (i.e 45% of the total) and the export figures are likely to increase. This port has a bright future and a great part to play in the international cashew trade .

★

-Continued from page 15-

Directorate of Cashewnut Development and experts in the field hold the view that the propagation of cashew through seeds and seedlings should be discouraged totally and that clonal materials (soft wood grafts) are the ideal planting material for improving yield.

High-yielding varieties of grafted cashew seedlings suitable for different agroclimatic tracts have been released by the cashew research stations. The multiplication of these varieties through clones and their use in new plantation and replantation will be the salient features of this programme.

The Directorate visualises setting up 40 regional nurseries for the multiplication of these clones and also programmes for transfer of scientific technologies to the farming community by way of farmers training programmes for development of model clonal cashew gardens and sufficient publicity measures for crop development.

The development of a farm model processing unit for cashew apple is also envisaged. Under this project, all inputs including planting materials, crop protection and other horticultural management practices would be provided to the beneficiaries with a maximum limit of Rs. 7,000 per hectare for 5 years for new plantation development, Rs. 9,200 for replanting programmes, Rs. 1,500 per hectare for intensive horticultural care and Rs. 800 per hectare for crop care measures.

Every state in India that come under the project will get financial assistance ranging from Rs. 5 crores to Rs. 8 crores during the Plan period, for onward disbursement to cashew growing community to undertake activities and programmes as per the 8th Five year Plan schemes.

■

COUNCIL PARTICIPATES IN FOODEX '94

Dr K.G. Nayar, Chief Executive & Secretary, CEPC,flanked by Mr Taisuke Nakajima,Chairman (Left) and Mr Shoichi Atarashi, Vice-Chairman (Right) of the Japan Nut Association, at the Council's stall at Foodex '94.

Foodex, Tokyo, an annual Food Fair, has been catering to the food and beverages market since 1976. The exhibition held at Nippon Convention Centre, Makuhari Messe, Tokyo, from 7th to 11th March '94, was organised by the Japan Management Association in conjunction with various trade associations and with the active support from the Government of Japan.

The Cashew Export Promotion Council of India participated in Foodex '94 Apart from the Council, Indian participation consisted of organisations like Marine Products Export Development Authority (MPEDA), Agricultural and Processed Food Products Export Development Authority (APEDA), Coffee Board and a number of private firms.

More than 1200 exhibitors from over 40 countries and above 8 lakh trade visitors took part in this international event to disseminate the latest trade information among existing and potential importers and buyers.

The Council displayed all grades of cashew and promotional literature and offered free samples of plain as well as roasted and salted cashew kernels in Council's pouches to increase public awareness of Indian cashews. Lots of visitors showed keen interest in the consumer packs of cashew kernels. The event thus provided a very good opportunity to enhance the international exposure to the Indian Cashew industry.

Dr. K.G Nayar, Chief Executive & Secretary, CEPC,organised the Council's participation at Foodex'94.

INDIAN CASHEW DELEGATION VISITS THE FAR EAST

The Cashew Export Promotion Council of India sponsored a three member delegation to visit Singapore, Republic of Korea, Japan and Hong Kong during October 1993. The programmes and visits of the delegation were co-ordinated by the Indian missions in the countries visited.

The delegation met various importers and processors of cashew during their visit

The delegation was able to ascertain the problems and prospects of cashew trade in the various countries visited by them. They were also able to bring up and maintain friendly and cordial business relationship with the existing and future clients in these countries.

The delegation also outlined the position of Indian Cashew in the world market and the plans for improving it in future. Japan is the largest importer of cashewnuts in this region. But there is scope for more sales for use in confectionery, chocolate, and home cooking. The delegation suggested a promotion programme to increase the consumption of cashew kernels in developed countries with active participation of processors and exporters.

The delegation was headed by Mr. P. Bharathan Pillai, Vice-Chairman of the Council. The other members of the delegation were Mr. R. Pratap Nair, Managing Director of M/s. Pratap Cashew Co. and Mr. K.V. Kamaladharan, Managing Director of Kerala State Cashew Works Apex Industrial Co-Operative Society Ltd (CAPEX), Quilon.

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EXPORTER'S PROFILE

Mr. K.N. Nair

JYOTHI EXPORT ENTERPRISES

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NNC Estates, Vadakkevila P.O.,
Quilon 691 010. Phone: 0474-79336, 75142, 72421.
Tlx: 886-272 JRMP IN. Fax: (91) 474-75740.

Jyothi Export Enterprises, headed by Mr. K.N. Nair is one of the leading processors and exporters of cashew in the land. It is a partnership firm which has registered rapid growth over the past few years. This can be seen in the huge increase in the sales turnover. Mr. K.N. Nair is a seasoned professional in the field of raw cashewnut procurement and cashew processing. Jyothi Export Enterprises is a part of the KJP Group which is spearheaded by Mr. Rajmohan Pillai. It is based in Kerala, with six operating offices in the country and international offices at Rotterdam, Singapore and London. The Group has modern integrated cashew processing units in Tamil Nadu, Kerala, Orissa and Andhra Pradesh.

The company's roasted and salted cashewnuts are exported under the brand name NUTKING in consumer packs. Packed in tin cans using imported machines, NUTKING matches any international brand in quality standards.

The Group has set up an R & D wing - the KJP Research Foundation - under which the KJP Institute of Horticultural Research develops improved methods of cultivation of cashew and other products . The Foundation is also doing specialised work on improvement of cashew crop, pest control and processing. It is fast growing into a centre of excellence.

Equipped with a highly professional team of managers and a dedicated work force, the Group is ready to take on new challenges and scale new heights of success and glory, true to its aim of becoming a formidable corporate force.

EXPORTER'S PROFILE

Mr. R. Sathiyanesan

GOWRI SANKAR CASHEW COMPANY

Manufacturers & Exporters of Cashew Kernels.

Soosaipuram, Mulankuzhi P.O.
Via: Kunnathoor, Kanyakumari District, T.N.
Tel: Off: 2317. Res: 2321.

Gowri Sankar Cashew Company, a sole proprietorship concern was established by Mr. R. Sathiyanesan in 1980. The company which had concentrated solely on the Indian market at first started exporting cashew products to other countries in 1982. Now it is doing extremely well in the international market.

The Company is totally involved in quality improvement. Nothing short of the best and internationally acceptable ever leaves the factory. There are stringent quality checks in every part of their operations, right from procurement of raw nuts to cleaning, processing, grading, packing and shipping.

Naturally, the major cashew importing countries have taken notice. The company is now exporting processed cashew to USA, USSR, UK, Australia, Japan, Singapore, Czechoslovakia and the Netherlands.

There has been a steady growth in the company's exports. The quantity of exports increased from 5,690 cases in 1989 to 6,110 cases by 1991. This meant an increase in turnover from Rs. 10.7357 million to Rs. 16.5473 million. If the same growth rate remains the company should cross the Rs. 20 million mark in the next couple of years.

With the drive and business acumen of Mr. Sathiyanesan, the company is all set to scale greater heights in the demanding world of the international cashew market.

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